

Systematic Study of the Genus *Macrosiphum* Takahashi (Hemiptera, Aphididae) in the Korean Peninsula

I. Subgenus *Unisitobion*

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Abstract Three species of *Macrosiphum* (*Unisitobion*) are recognized from the Korean Peninsula, among which *M. (Unisitobion) sorbi* Matsumura, 1918 and *M. (Unisitobion) perillae* (Zhang, 1988), **comb. nov.** are new to the Korean Peninsula. Morphological characteristics are discussed with the microscopic photos. Two species, *M. (Unisitobion) sorbi* and *M. (Unisitobion) perillae* are redescribed. The subgeneric position of each species is discussed. The host plants, brief biology, and a key to all known species of the subgenus are also presented.

Key words Hemiptera, Aphididae, *Macrosiphum*, *Unisitobion*, Korean Peninsula

INTRODUCTION

The *Unisitobion* Takahashi, 1961 is a small subgenus belonging to the genus *Macrosiphum* Passerini, 1860 comprising one species, *M. (Unisitobion) sorbi* Matsumura, 1918 (Remaudière et Remaudière, 1997). The genus *Unisitobion* was erected by Takahashi (1961), and Miyazaki (1971) imported *Macrosiphum colylicola* Shinji into this genus. However, Eastop and Hille Ris Lambers (1976) replaced *M. colylicola* to the subgenus *Neocorylobium* MacGillivray, 1968. Therefore, up to date, only one species is valid in the subgenus *Unisitobion* throughout the world. The subgenus *Unisitobion* is distinguishable from other species of the tribe Macrosiphini by the following characters: polygonal reticulation less than distal 1/3 of siphunculi; 1st tarsal segment bearing with three hairs; ventral surface of head spinulated; dorsum of abdomen dark sclerotized.

We recognized three species of the subgenus *Unisitobion*, based on the aphid collections from the Korean Peninsula. Examining all the specimens in detail, *Macrosiphum perillae* Zhang, 1988 (= *Sitobion perillae*) is imported from the genus *Sitobion* and *Macrosiphum corylicola* is returned to the previous position (see Remarks for each species and Discussion). The *M. perillae* and *M. sorbi* are redescribed with the microscopic photos, supplementary to the previous incomplete descriptions.

For this study, the aphid collections have been made from South Korea by authors during last five years, and the collections from North Korea by the expeditions of the Czech Institute of Entomology in 1985, 1987, and 1988. Some specimens were also available from the Insect Collection in the National Institute of Agricultural Sciences and Technology, Suwon, Korea. Abbreviations used in this paper are as follows: Ant. I, III, VIb- Antennal segment I, III, base of Ant. VI, respectively; PT- processus terminalis; URS- ultimate rostral segment; 2HT- second segment of hind tarsus; SIPH- siphunculus; apt.- apterous viviparous female, apterae; al.- alate viviparous female; ov.- oviparous female, oviparae.

SYSTEMATIC ACCOUNTS

***Macrosiphum (Unisitobion) corylicola* (Shinji, 1930), comb. rev.**

개암나무수염진딧물 (개칭) (=산딸나무수염진딧물)

Macrosiphum corylicola Shinji, 1930: 27.

Unisitobion corylicola: Miyazaki, 1971: 18; Paik, 1972: 535.

Macrosiphum (Neocorylobium) corylicola: Eastop et Hille Ris Lambers, 1976: 266; Remaudière et Remaudière, 1997: 117.

Specimens examined. South Korea: 12 apt., Daehyun-ri, Bukhu-myon, Andong, 1 VII 1999, on *Corylus heterophylla* Fisher var. *japonica* Koidzumi (Betulaceae). North Korea: 21 apt., 8 al., Dokgol, Mt. Myohyangsan, 15 VI 1985, on *C. heterophylla*; 3 apt., 1 al., Mt. Ryongaksan, Pyongyang, 7 VII 1987, on *C. heterophylla*.

Distribution. Korea (South, North), Russia (Far East), Japan.

Host plants. *C. heterophylla*., *Corylus sieboldiana* Bl. (Betulaceae), *Carpinus laxiflora* (Betulaceae).

Biology. Probably monoecious holocycle on the summer host, *Corylus* spp. and *Carpinus* spp. Live on the leafstalk or underside of leaf.

Remarks. Paik (1972) reported this species from Korea on *Cornus kousa* Buerger. (Cornaceae), an unusual host plant. In the same book, he presented a colour picture of a colony on *Corylus heterophylla*. In this context, it seems that he might misidentify the host plant. Therefore, the Korean Name for this species derived from the Korean name of *Cornus kousa* should be changed. Because the antennae, femur and siphunculi are not imbricated, this species is more close to the subgenus *Unisitobion* than *Neocorylobium*, of which those are imbricated. Therefore, we propose the recombination of this species with the subgenus *Unisitobion*.

***Macrosiphum (Unisitobion) sorbi* Matsumura, 1918**

쉬땅나무수염진딧물 (신칭) (Fig. 1)

Macrosiphum sorbi Matsumura, 1918: 4.

Unisitobion sorbi: Takahashi, 1961: 104; Miyazaki, 1971: 17.

Macrosiphum (Unisitobion) sorbi: Eastop et Hille Ris Lambers, 1976: 267; Remaudière et Remaudière, 1997: 117.



Fig. 1. Apterous viviparous female *Macrosiphum (Unisitobion) sorbi* Matsumura. 2, head and thorax; 3, antennal segment III; 4, hind tibia and tarsus; 5, siphunculi and cauda. Scale bars equal 0.5 mm (1, 4) and 0.25 mm (2, 3, 5).

Description. Apterous viviparous female. Colour (alive): pale yellow with three brown longitudinal stripes marginally and mesially from thorax to abdomen; antennae and legs pale except the distal part of femur and tibia; siphunculus black; cauda pale. Colour (macerated specimen): head pale brown with dark brown antennal tubercle; pronotum pale brown; meso- and metanotum and abdomen pale with irregular dark pigmentation laterally and mesially; antennae pale except Ant.I, II, VI, and the distal part of Ant.III, Ant.IV, and Ant.V dusky or black; legs pale except distal end of femur and tibia including tarsus dark brown; siphunculus black; cauda pale.

Morphology: Body spindle shaped, 2.50–3.82 mm long from the antennal tubercle to the end of cauda. Head: smooth dorsally with three pairs of short blunt hairs, two more pairs on vertex, the longest 1/2 as long as the basal width of Ant.III, strongly and densely spinulated ventrally. Antennal tubercle well developed, U-shaped, spinulated with 3–4 short hairs on each inner side. Antennae long, 1.5 times as long as the body length: I, 0.18–0.23 mm; II, 0.08–0.13; III, 0.90–1.15; IV, 0.68–0.93; V, 0.63–0.85; VIb, 0.23–0.28; PT, 1.08–1.33. Ant.I spinulated with 5–8 hairs; Ant.II granulated with 4 hairs;

Ant. III smooth, weakly imbricated basally with ca. 35 short blunt hairs, the longest $1/4$ as long as the middle width of the segment with 2–7 secondary rhinaria confined to basal $1/3$ in a row; Ant.IV weakly imbricated with ca. 20 hairs; Ant.V weakly imbricated with ca. 13 hairs and ciliated primary rhinaria, the longest diameter shorter than the middle width of the segment; Ant.VIb with 3–5 short hairs; PT with ca. 11 short hairs. Rostrum short attaining the anterior margin of mesocoxae; clypeus with 3–4 hairs; mandibular lamiae with 2 hairs; URS (0.10–0.12 mm) short, wedge-shaped, 0.4 times as long as Ant.VIb, as long as the 2HT, with 6 accessory hairs, the longest shorter than the apical primary setae. Thorax: prothorax smooth dorsally with 1 pair of spinal hairs and 2 marginal hairs on each side. Hind coxae spinulated with ca. 16 hairs, the longest $1/2$ as long as the basal width of hind femur; trochanter smooth with 3–4 hairs; hind femur spinulated distally with short, blunt setae, the longest $1/3$ as long as the basal width of the segment; tibia smooth with blunt and acute hairs, the longest $1/2$ as long as the middle width of the segment; first tarsal segment spinulated and imbricated with 3 hairs; 2HT (0.10–0.12 mm) imbricated with 3 dorsal hairs and 6–7 ventral hairs. Abdomens: tergite with 8–12 short hairs (the longest $1/5$ as long as the basal width of hind femur) on tergite III, 5–6 on tergite VI between siphunculi; tergite VIII with 6–8 acute hairs. SIPH (0.65–1.10 mm long) cylindrical, widest at base, spinulated on basal $1/3$, imbricated in the middle, and reticulated on the apical $1/10$, well fringed, more than 3 times as long as cauda. Cauda tongue-shaped, strongly spinulated with 7 acute hairs. Genital plate weakly spinulated with 1 pair of long anterior hairs medially and 8–10 short hairs on posterior margin.

Alate viviparous female. Colour (alive): thorax dusky; the pigmentation of abdomen not continuous, isolated marginally and spinally from tergite I to tergite VI. Otherwise like as in apterae. Morphology: ca. 20 secondary rhinaria on the Ant.III. Otherwise like in apterous vivipara.

Specimens examined. South Korea: 1 apt., 1 al., 1 nymph (fifth instar), Sogeu-gang, Jumunjin, Gangwon-do, 3 VI 1999, on *Sorbaria sorbifolia* (Rosaceae). North Korea: 3 apt., 1 al., Jururongpho-ri, Chongjin Distr., 19 VI 1987, on *S. sorbifolia* var. *stellipila* Max.; 4 apt., 1 al., Mt. Myohyangsan, 26 VI 1987, on ?*Astilbe chinensis* Franch & Sav. (Saxifragaceae); 6 apt., Mt. Baekunsan, Baektu Mts. Reg., 29 VI 1988, on *S. sorbifolia*.

Distribution. Korea (South, North, new record), Japan

Host plants. *Sorbaria sorbifolia*, ?*Astilbe chinensis* (probably a misidentification of *Sorbaria* sp.), *Sorbus japonica* Koehne (Rosaceae), by the original record of Matsumura, 1918 in Sapporo, Japan).

Biology. Collected from the underside of *Sorbaria sorbifolia* leaves, also recorded on *Sorbus japonica* by the original record of Matsumura, 1918 in Sapporo, Japan. Host alternation from *Sorbus* sp. to *Sorbaria* sp. should be checked.

Remarks. Abdominal tergum of viviparous apterae on *Sorbaria sorbifolia* from Korea is pale except the antesiphuncular sclerite, whereas that of Japanese and North Korean specimens are well pigmented laterally and medio-longitudinally.

***Macrosiphum (Unisitobion) perillae* G.-x. Zhang, 1988, comb. nov.**

산박하수염진딧물 (신칭) (Fig. 2)

Sitobion perillae G.-x. Zhang in G.-x. Zhang and Zhong, 1988: 146.

Unisitobion corylicola ? : Moritsu, 1982: 268 (misidentification).

Sitobion perillae: G. Remaudière et M. Remaudière, 1997: 146.

Description. Apterous viviparous female. Colour (alive): head black; body pale yellow with broad black longitudinal band marginally from head to abdominal tergite VI, at which two bands connected; antennae and legs black except basal part of femur pale; siphunculi black; cauda pale. Nymphs milky white except black appendages. Colour (macerated specimen): head black except posterior half of dorsum pale medially; dorsum of thorax pale in the middle; abdomen pale medially and black marginally from tergite I to tergite VI, at which two marginal black band connected. Tergites VII, VIII and cauda pale; SIPH black; antennae and legs black except coxae, trochanter, and the basal 1/3 of femur pale.

Morphology: body spindle-shaped, 1.83–3.18 mm long including cauda. Head: smooth dorsally with 3 pairs of blunt hairs, 2 pairs on vertex between antennal tubercles, the longest as long as the basal width of Ant.III, weakly spinulated ventrally; antennal tubercle well developed, divergent, U-shaped with three hairs on each inner side. Antennae 2.88–4.25 mm long, 1.3 times as long as the body length: I, 0.13–0.20 mm; II, 0.07–0.12; III, 0.67–0.98; IV, 0.48–0.91; V, 0.44–0.58; VIb, 0.14–0.23; PT, 0.84 – 1.05. Ant.I smooth with 7–8 hairs; Ant.II smooth or weakly spinulated with 4 hairs; Ant.III weakly imbricated with ca. 12 blunt or weakly capitated short hairs, the longest lesser than 1/2 as long as the basal width of the segment, 3–13 secondary rhinaria confined to basal 1/3 in a row, occasionally spread up to the basal 2/3; Ant.IV imbricated with ca. 10 short hairs; Ant.V imbricated with ca. 8 hairs and a ciliated primary rhinaria, the longest diameter shorter than the middle width of the segment; Ant.VIb with 3–4 hairs; PT long, ca. 5–6 times as long as Ant.VIb with 9 hairs. Rostrum attaining the posterior margin of mesocoxae; clypeus with 4 setae; mandibular lamiae with 2 hairs on each side; URS wedge-shaped, shorter (0.12–0.14 mm) than Ant.VIb, slightly longer than 2HT, blunt apically with 6–8 accessory hairs, the longest shorter than the apical primary one. Thorax: Prothorax with 1 pair of spinal hairs and 2 marginal ones. Hind coxae smooth with ca. 9 hairs, shorter than the basal width of hind femur; trochanter smooth with 3–4 hairs; hind femur smooth with short, blunt hairs, the longest 0.4 times as long as the basal width of the segment; tibia smooth with blunt or acute hairs, the longest as long as or slightly shorter than the middle width of the segment; 2HT imbricated with 3–5 dorsal hairs and 5–6 ventral hairs. Abdomen: dorsum with 5–8 blunt or slightly capitated hairs on tergite III, 4 on tergite VI between SIPH, and 4–6 on tergite VIII, the longest slightly shorter than the basal width of hind femur. SIPH 0.55–1.10 mm long, cylindrical, widest at base, narrowest at distal reticulated zone, weakly spinulated and reticulated on distal 1/10, well franged, 2.5 times as long as cauda. Cauda 0.27–0.40 mm long, strongly spinulated with 6–7 hairs. Genital plate pale with 1 pair of long median hairs and ca. 17 short hairs on posterior margin.

Alate viviparous female. Colour (macerated specimen): thorax and abdomen differ from apterae as follows; thorax dusky brown; tergites I–IV pale with irregular large dark sclerites laterally on each segment, few small dark sclerites scattered on dorsum medially; tergite V and VI well pigmented around siphunculi, and connected at tergum 6. Wings pale. Otherwise like as in apterae. Morphology: ca. 25 secondary rhinaria on Ant.III in a row. Cauda relatively narrow, with a weak constriction in the middle. Others like in apterae.

Oviparous female. Slightly differs from the apterous viviparous female as follows: hind tibia pale or

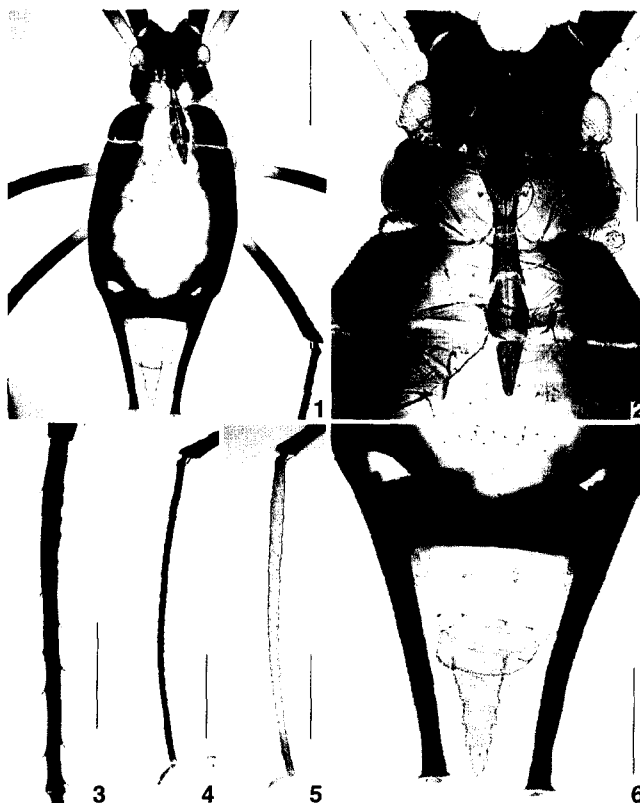


Fig. 2. Adults of *Macrosiphum (Unisitobion) perillae* G.-x. Zhang. 1-4, 6, apterous viviparous female (2, head and thorax; 3, antennal segment III; 4, hind tibia and tarsus; 6, siphunculi and cauda), 5, oviparous female (hind tibia and tarsus). Scale bars equal 0.5mm (1, 4, 5) and 0.25mm (2, 3, 6).

dusky except black distal end, swollen with numerous pseudosensoria.

Alate male. Similiar to alate viviparous female but differs as follows: abdominal tergite pale with small irregular dark sclerite laterally and pale brown pigmentation around siphunuculi, not connected at tergite 6. Body small, 1.80 mm long. Antennae with about 40-50 secondary rhinaria on Ant.III, 2-7 on Ant.IV, and 15-18 on Ant.V.

Specimens examined. South Korea: 1 apt., 9 ov., 2 males, Daebudo, Hwasung, 18 X 2000, on *Isodon inflexus* (Thunberg) Kudo (Labiatae); 1 apt., Geumsung Rest Area, Euisung, Gyeongsanbuk-do, 24 V 2000, on *I. inflexus* (Thunberg) Kudo. North Korea: 1 apt., Haeju, 30 V 1987, on *Mentha arvensis* var. *piperascens* Malinv. (Labiatae); 92 apt., 6 al., Onjeong-ri, Kumgangsan Distr., 9 VI 1987, on *Isodon excisus* (Max.) Kudo (Labiatae); 1 apt., Jururongpori, Cheongjin Distr., 19 VI 1987, on *I. excisus*; 3 apt., Samilpo, Mt. Geumgangsan Distr., 20 V 1988, ?*Rosa multiflora* Thunb. (Rosaceae); 44 apt., Botan. Garden, Pyongyang-si, 31 V 1988, on *M. arvensis* var. *piperascens*.

Biology. Live on the upper stem or underside of leaves of host plant, *Mentha* spp., *Perilla* sp. and *Isodon* sp. in the family Labiatae. Rather common in North Korea but rarely encountered in South Korea. According to the collection of sexual morph (both oviparae and male), this species might be

monoecious holocycle on the summer host, particularly *Isodon inflexus*.

Host plant. *Mentha arvensis* var. *piperascens*, *Isodon excisus*, *Rosa multiflora* (possibly misidentification of host plants), *Perilla ocymoides* L., *Perilla* spp., *Isodon japonicus* (N. L. Burm.) Hara (by Moritsu, 1982).

Distribution. Korea (South, North, new record), China, Japan (new record).

Remarks. This species was described by G.-x. Zhang and Zhong (1988) under the genus *Sitobion*. However, it is well corresponding to the subgenus *Unisitobion* by the highly developed antennal tubercle and the head spinulated ventrally. Additionally, this species has up to 6 hairs on the abdominal tergite VIII, while the genus *Sitobion* has 4 hairs. Moritsu (1982) presented pictures taken on *Isodon japonicus* and a description which are fit very well to this species, but he determined it as *M. (Unisitobion) corylicola* with question. Considering the colouration and shape in his fine picture, description, and the host plant, it can not be *M. corylicola* but *M. (Unisitobion) perillae*. This is the first record to Korea and Japan.

Key to the species of subgenus *Unisitobion* in the Korean Peninsula

1. Antennal segment III and tibia except distal 1/4 pale. First tarsus imbricated Abdominal tergite with median longitudinal dark line of pigmentation. On *Sorbaria* sp. *Macrosiphum (Unisitobion) sorbi*
 - Antennae and tibia dark black. First tarsus Smooth. Abdominal dorsum pale medially without the longitudinal line. 2
2. Head smooth dorsally, weakly spinulated ventrally around clypeus. URS lesser than 1.5 times as long as the 2HT with 6–8 secondary setae. Abdominal tergite well pigmented laterally and between siphunculi. Holocycle on *Perilla* spp., *Mentha* spp. and *Isodon* spp. (Labiatae) *M. (Unisitobion) perillae*
 - Head spinulated at least ventrally. URS long, almost 2 times as long as 2HT with 12 secondary setae. Abdominal tergite usually pale except the dark pigmentation around SIPH. Holocycle on *Corylus* spp. and *Carpinus* spp. *M. (Unisitobion) corylicola*

DISCUSSION

Takahashi (1961) established the *Unisitobion* as an independent genus for a single species, *Unisitobion sorbi* (Matsumura, 1918) with the difference from the genus *Macrosiphum* by “the presence of spinules on the head and on the first segment of tarsus, and in the tibiae a little striated on the distal part”. In 1971, Miyazaki (1971) imported one more species, *Unisitobion corylicola* (Shinji) from the genus *Macrosiphum* and made an diagnosis for the genus as “Head spinulated ventrally; abdominal tergum sclerotized and pigmented; antennal tubercles high”.

On the other hand, McGillivray (1968) established a new genus *Neocorylobium* for *Macrosiphum carpinicolens* Patch, 1919 and *Corylobium vandenboschi* Hille Ris Lambers, 1966, and described the diagnosis for the genus as “Tergum scabrous in apterous viviparous females. Frontal tubercles well developed, rough, diverging. Antennae imbricated, with rhinaria on segment III in apterae and alatae. First tarsal segments with 3 hairs. Siphunculi cylindrical with well-developed reticulations just before the

frange, remainder imbricated. Cauda elongate, thick at base”.

Considering the definitions by Takahashi (1961), Miyazaki (1971) and MacGillivray (1968), *Unisitobion* and *Neocorylobium* are very closely related except the minor differences of spinules on the first tarsal segment and the imbrication of antennae and siphunculi which varies. Thus *Neocorylobium* can be treated as a junior synonym of *Unisitobion*. However, it is better to keep both subgeneric name as valid until further study clarify the validity of the subgeneric division of the genus *Macrosiphum* including the genus *Sitobion* Mordvilko, 1914, which has been often treated as a subgenus of *Macrosiphum*. In this context, therefore, we employ the subgeneric name *Unisitobion* for *M. sorbi*, *M. corylicola*, and *M. prillae* (= *Sitobion perillae*).

ACKNOWLEDGEMENTS

We thank Dr. R.G. Footitt (Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, Ottawa, Canada) and Dr. M. Miyazaki (National Institute of Sericultural & Entomological Sciences, Tsukuba, Ibaraki, Japan) for generous loans of specimens and sending many helpful references on request, and Mr. G.S. Lee (National Institute of Agricultural Science and Technology, Suwon, Korea) for the collection of some specimens. This is a partial result of the Cooperative Research Project, “Aphids, their parasitoids and the biological control of aphids on the Korean Peninsula” between the Institute of Entomology (IE), Czech Academy of Sciences (CAS) and the National Institute of Agricultural Sciences and Technology (NIAT), Rural Development Administration (RDA) of the Republic of Korea.

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(Received: December 15, 2001)

(Accepted: February 22, 2001)